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The Essential Guide To Amino Acids

by Carol Ballentine

At the local county fair, a woman stops at a booth selling herbal products. One weight-loss powder has a price tag of $30 and an accompanying brochure that reads, "This is a *high*-quality protein food. It has *all* 22 protein-building amino acids, including the 9 *essential* amino acids that your body *cannot* produce and *must* be supplied by your diet." Wow, the woman thinks, *9 essential amino acids*! She's been meaning to go on a diet anyway, so she buys the product.

The woman is wasting her money. Amino acids are needed by the body, but she's probably getting all she needs—including enough of all the essential ones—just by eating an adequate diet.

Amino acids are showing up a lot these days. They appear in herbal products, grapefruit diet pills, bee pollen, individually in bottles labeled "L-Tryptophan," "D-Phenylalanine," and "Tyrosine," and in various combinations with other amino acids and vitamins. They have been hailed in articles and advertisements in magazines and newspapers for use in depression, weight loss, insomnia, pain, cold sores and fatigue. But such claims do not appear on the product labels because, if they did, the manufacturer would have to prove that they are true. This would be difficult or impossible to do in many cases.

For all the media brouhaha, amino acids are simply essential nutrients that most Americans get plenty of in their usual diets. They are the chemical building blocks of protein and are found in a wide variety of foods, from pork chops to bread, from beans and peas to milk and tacos. The nine essential amino acids are those that cannot be manufactured by the body and must be consumed in food. A glass of milk, for instance, easily provides a healthy dose of all nine essential amino acids, just like that weight-loss powder but at a fraction of the cost. There are other amino acids that are manufactured by the body and have been dubbed, somewhat misleadingly, the "nonessential" amino acids. In fact, both the essential and nonessential amino acids must be present in the body for protein manufacture to take place.

The addition of amino acids to foods is approved by FDA for only two purposes: fortifying protein-containing foods to improve the food value of the protein, and treating metabolic disorders related to certain diseases. In the latter case, such use may make the product a "medical food." These products generally must follow the rules for drug testing to show they are truly effective for their intended use. Their purpose is usually to induce a pharmacologic (drug-type) change in the body's metabolism. For example, special amino acid mixtures may be used to meet the needs of people who have liver or kidney disease. Such cases require medical supervision and the products would not be generally available to the public.

FDA feels that it can be dangerous for consumers to take large amounts of any individual amino acid. Animal studies have shown that amino acid imbalances can be created in the body by abnormal intakes of specific individual amino acids. Therefore, amino acids were removed from the agency's list of substances generally recognized as safe (GRAS) in 1974.

Most people can get more than enough amino acids in the foods they usually eat. Only in rare cases are special protein and amino acid supplements required. The exceptions include: people born with a genetic disorder, such as phenylketonuria (PKU), that makes them unable to metabolize a particular amino acid, and people with chronic diseases that affect the small intestine, such as Crohn's disease (an inflammation of the lower part of the small intestine) and celiac disease (caused by an intolerance to gluten, a protein found in wheat and other grain). People with these conditions might be advised by their doctors to take special protein or combination amino acid supplements to satisfy protein requirements. But here again, amino acids used in this way are considered to be medical foods, intended for use solely under medical supervision to meet nutritional requirements in specific medical conditions. There is no reason for a normal, healthy person to take amino acid or protein supplements to fulfill protein requirements.

But what about amino acids sold individually and the health claims made for them? Can tryptophan cure depression or insomnia? Can phenylalanine cause weight loss? No manufacturer has provided FDA with the necessary scientific proof that any particular amino acid has any use in treating any disease or conditions such as obesity or insomnia, and FDA has not approved any individual amino acid for any such use.

Why exactly would a person want to take an amino acid supplement? A look at tryptophan, which has been promoted for treating depression and insomnia, might provide some clues.

A number of studies have been done on the use of tryptophan and its chemical relatives to treat depression. Dr. Richard Wurtman, physician and neuroendocrinologist at the Massachusetts Institute of Technology, and a colleague showed in 1971 that brain levels of tryptophan directly control how much of the neurotransmitter serotonin the brain manufactures. Some types of depression are thought to be linked to abnormal serotonin levels; thus, researchers have postulated that depression might be treated with increased levels of tryptophan to help the body produce more serotonin.

But the results of this research have been inconclusive. In one set of studies, some patients responded positively to tryptophan, while others became worse. An article in a German publication,

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Protein: Getting The Complete Package

The average person usually does not ponder the chemical composition of a fried egg or toasted cheese sandwich while eating it. But some pondering might be useful, particularly for those of the completely vegetarian persuasion.

Food protein, an essential component of everyone's diet, is made up of amino acids. For humans there are two categories of amino acids: the nonessentials, which can be manufactured by the body, and the essentials, which cannot be thus manufactured and so must be supplied by the diet. Tyrosine is considered nonessential because it is manufactured in the body from phenylalanine; phenylalanine is considered an essential amino acid because it can only be obtained from food. The other essential amino acids are: methionine, threonine, tryptophan, histidine, isoleucine, lysine, valine, and leucine.

Some vegetarian diets can be so high in bulk that they may not meet caloric needs. Because of diminished calories, protein must be used by the body as an energy source, to supplement the energy usually derived from fat and carbohydrates. Thus the protein content of the diet is critical and makes being a vegetarian tricky. Protein nutrition can be improved by increasing the protein quantity and quality of the vegetarian diet.

Vegetable proteins (such as from grains, legumes and other vegetables) tend to lack one or another of the essential amino acids. (This is why animal protein is sometimes called "complete protein" and vegetable protein "incomplete.") Therefore, those who eschew animal products need to go about their diet selection in a way to ensure adequate protein nutrition by using complementary foods. For instance, most rice is low in lysine, while some legumes are low in methionine but

high in lysine. Thus, a meal of beans (a legume) and rice provides a combination of food proteins with improved quality.

Many cultures have made use of these dietary combinations for hundreds of years without understanding their nutritional importance. Even today much of the world's population subsists by combining various forms of vegetable protein. Think of the well-known staples of Mexican diets —refried beans and rice or beans and corn tortillas. Or the penchant the Chinese and Japanese have for mixing rice with bean curd. In India, rice is mixed with lentils. In the southeastern United States, the combination is rice and black-eyed peas. All these combinations provide balanced amounts of all the essential protein building blocks our bodies need.

Some vegetable proteins can also be supplemented with a small amount of animal protein. This is illustrated again in Chinese cuisine, in which a small portion of meat or fish is added to stir-fried vegetables on a large mound of rice. Americans commonly use this technique in such commonplace recipes as macaroni and cheese, pizza, or the ubiquitous sandwich. Vegetarian cookbooks provide many examples of combining "incomplete proteins" or complementing vegetable proteins with animal products to get a "complete" supply of the essential amino acids. ■

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Fortschritte der Neurologie-Psychiatrie, in May 1983, reviewed the studies on tryptophan as an antidepressant. The authors, H. Beckman and S. Kaspar, concluded that "results of numerous therapeutic trials with L-tryptophan are not convincing of this compound's antidepressant efficacy in marked to severe endogenous depressions [those without apparent external cause]. On the other hand, it cannot be excluded that it is effective in moderate . . . states with apathy and sleep disturbances. However, possible toxic effects of high and long term use render its clinical use doubtful." According to the authors, proven antidepressant drugs are more effective than L-tryptophan.

Despite the inconclusive studies and the fact that tryptophan is not approved by FDA for depression, the tryptophan-depression link found its way into the popular press and magazine ads, and bottles of the amino acid are found on many drugstore shelves (usually with the noncommital recommendation to "take 1 to 3 tablets daily" but with no indication for what purpose).

Tryptophan has also been hailed in the popular press as a sleep aid. On this subject, the *Handbook on Nonprescription Drugs* says, "When used in treating insomnia, doses of 1-10 grams have been effective in . . . increasing total sleep time. However, there is also evidence that REM sleep [a critical stage of sleep during which dreaming occurs] may be suppressed and additional studies are needed to determine the clinical usefulness of this agent." Tryptophan is not approved by FDA or recognized by the American Medical Association as a treatment for insomnia. According to the *AMA Drug Evaluations* (fifth edition), "Because the hypnotic action has not been confirmed in other studies, this use of L-tryptophan must be considered investigational and the drug is not recommended in routine clinical practice."

Neither tryptophan nor any other amino acid or protein supplement has been approved by FDA as effective for weight loss, although many have been promoted for this use. One of the most popular is spirulina, a dark-green powder or pill made from blue-green algae. An article in the *National Enquirer* in 1981 claimed that phenylalanine, an amino acid found in spirulina, "acts on the brain's appetite center to switch off your hunger pangs." An ad in *Vegetarian Times* in 1985 promoted one of the many grapefruit diet pills as containing "hunger-quenching Amino Acids." And a number of products containing arginine and ornithine (both amino acids) have hit the weight-loss scene recently, advertised as "causing weight loss overnight" due to increased release of human growth hormone.

No data submitted to FDA have supported such claims for these products. The case for arginine products is particularly unconvincing. In the first place, it is unlikely that the amount of arginine in the pills is large enough to cause the release of human growth hormone. (In clinical settings arginine is used for this purpose when doctors want to measure whether a patient's secretion of human growth hormone is normal—but the amount used is quite large and it is injected, not taken orally.) In the second place, when subjects in studies have been given human growth hormone outright, they have not lost weight. The FDA advisory panel on over-the-counter weight-control drug products reviewed 12 amino acids in 1978: arginine, cystine, histidine, isoleucine, leucine, L-lysine, methionine, phenylalanine, threonine, tryptophan, tyrosine and valine. The panel could find no data to prove the safety and effectiveness of any of these products in weight control.

Studies have also been conducted on the relationships between depression and tyrosine and pain and leucine and phenylalanine. Tryptophan has been tested for a host of other conditions, including schizophrenia, premenstrual syndrome and pain.

These studies, for the most part, are legitimate quests for knowledge; but the health claims made to consumers for amino acid products by manufacturers have no scientific basis to show that the products are safe and effective. The sometimes ambiguous results of one or two studies are not sufficient to demonstrate that a product is effective in treating a particular disease or condition. For instance, some early studies of lysine indicated that it might be useful in treating herpes infections. However, later, better-controlled studies failed to duplicate these findings, and lysine is not recommended as therapy for herpes.

The study of amino acids and brain chemistry is an exciting area of scientific research and one that may open many doors to more effective drug treatment in the future. Many researchers believe that some day chemicals involved in the body's production of neurotransmitters, such as tryptophan, will be used therapeutically. But that day is not now, and the same scientists doing these studies have cautioned that people should not medicate themselves with amino acid supplements sold through the mail, at county fairs, or in health food stores. It is unclear, they say, just how safe and effective these supplements are over the long run. When it comes to amino acids, it's safer and cheaper to look for them in a glass of milk, a peanut butter sandwich, or any of the countless other protein-rich foods and leave the "supplements" on the shelf. ■

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